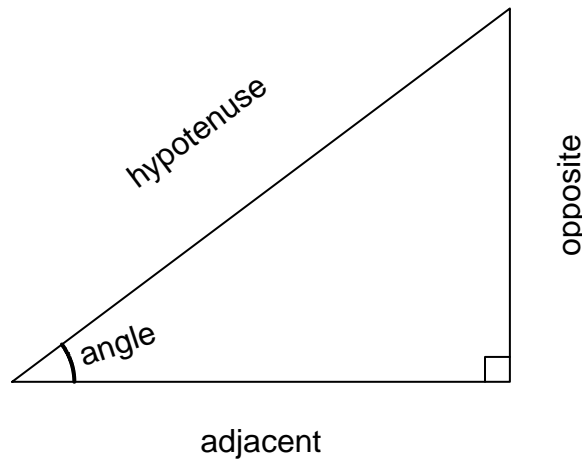


**Trig cheat sheet**

Below shows the right-triangle definitions of the 6 trigonometric functions: sine, cosine, tangent, cosecant, secant, and cotangent. The hypotenuse is the longest side of a right triangle, and the hypotenuse is always across from the right angle. The opposite leg is across from the indicated angle, and the adjacent leg is the non-hypotenuse side that is adjacent to the angle.



$$\sin(\text{angle}) = \frac{\text{opposite}}{\text{hypotenuse}}$$

$$\cos(\text{angle}) = \frac{\text{adjacent}}{\text{hypotenuse}}$$

$$\tan(\text{angle}) = \frac{\text{opposite}}{\text{adjacent}}$$

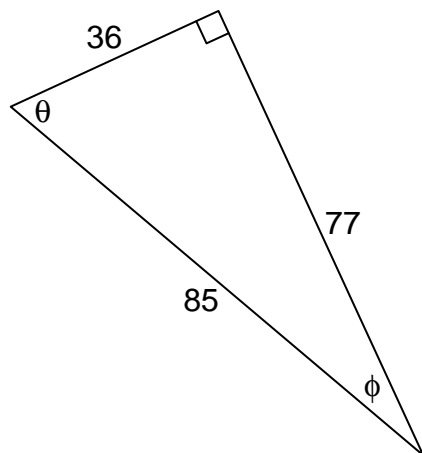
$$\csc(\text{angle}) = \frac{\text{hypotenuse}}{\text{opposite}}$$

$$\sec(\text{angle}) = \frac{\text{hypotenuse}}{\text{adjacent}}$$

$$\cot(\text{angle}) = \frac{\text{adjacent}}{\text{opposite}}$$

**Question 1**

Consider the right triangle below, with side lengths 36, 77, and 85 and acute angle measures  $\theta$  and  $\phi$ .

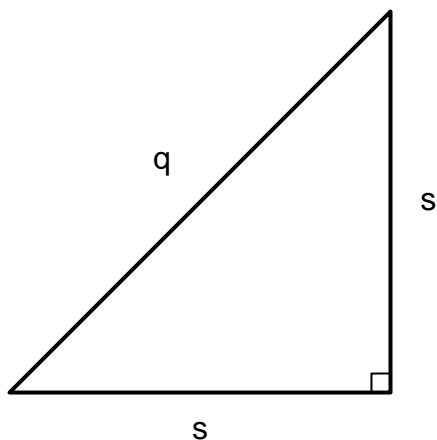


Express the 6 trigonometric ratios of angle  $\phi$ . Write each ratio as a fraction. When relevant, use an improper fraction (like  $\frac{5}{3}$ ), not a mixed number (not like  $1 + \frac{2}{3}$ ).

Trig function	Ratio (function's output)
$\sin(\phi) =$	
$\cos(\phi) =$	
$\tan(\phi) =$	
$\csc(\phi) =$	
$\sec(\phi) =$	
$\cot(\phi) =$	

**Question 2**

Consider the isosceles right triangle below.

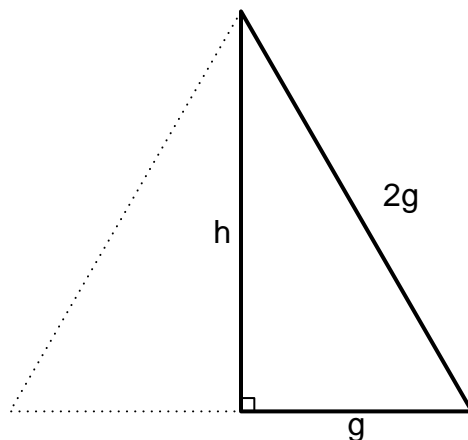


**Prove** that  $q = s\sqrt{2}$ .

(Remember Pythagorean Theorem: a triangle with lengths  $a$ ,  $b$ , and  $c$ , where  $a \leq b < c$ , is a right triangle if and only if  $a^2 + b^2 = c^2$ .)

**Question 3**

Consider the triangle below, generated by bisecting an equilateral triangle.

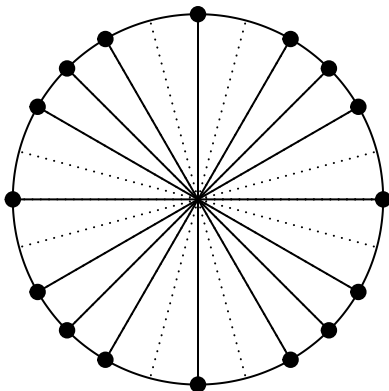


**Prove** that  $h = g\sqrt{3}$ .

(Remember Pythagorean Theorem: a triangle with lengths  $a$ ,  $b$ , and  $c$ , where  $a \leq b < c$ , is a right triangle if and only if  $a^2 + b^2 = c^2$ .)

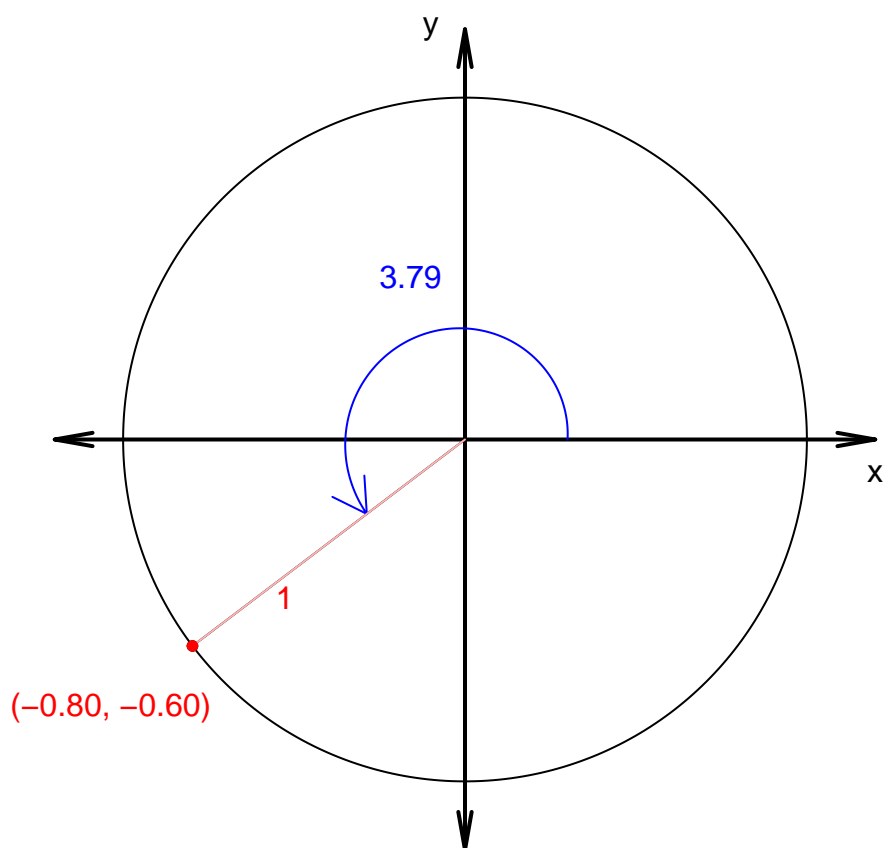
Question 4

A unit circle (with radius = 1) is drawn with its center at the origin. Based on the two proofs in Question 2 and Question 3, determine the angles and (exact) coordinates of the indicated 16 points, with the angle measure increasing, starting at 0, and all angles in standard position. All angles are multiples of  $1/24$  of a revolution.



Angle measure (degrees)	Angle measure (radians)	$x$	$y$

## Question 5



An angle of 3.79 radians intersects the unit circle at coordinates  $(-0.8, -0.6)$ . Fill the blanks in the two equations below.

$$\sin \left( \boxed{\phantom{000}} \right) = \boxed{\phantom{000}}$$

$$\cos \left( \boxed{\phantom{000}} \right) = \boxed{\phantom{000}}$$

$$\tan \left( \boxed{\phantom{000}} \right) = \frac{\boxed{\phantom{000}}}{\boxed{\phantom{000}}}$$